REMARKS

STATUS OF THE CLAIMS

Claims 1-10, 12, 21-23, 43-45, and 48-53 were pending in this application. Rejections are still pending for claims 1-10, 12, 21-23, and 48-53. Claims 43-45 are objected to. Claims 1, 10, 12, 21, 22, 23, 48, and 53 have been amended. Following entry of the amendments, claims 1-10, 12, 21-23, 43-45, and 48-53 will be pending and at issue.

INTERVIEW SUMMARY

On February 28, 2006, a telephonic interview was conducted between Antonia Sequeira and Examiner Heneghan. The parties discussed the Applicants' arguments submitted in the prior response of December 22, 2005. In addition, the parties discussed possible amendments to the claims, and the Examiner indicated certain amendments that would likely overcome the prior art. The claims have been amended herein in accordance with these discussions during the Interview.

ALLOWABLE SUBJECT MATTER

Applicants acknowledge with appreciation the Examiner's statement that claims 43-45 would be allowable if rewritten in independent form to include all of the limitations of the base claim and any intervening claims. Office Action, p. 10.

PRIOR OBJECTIONS AND REJECTIONS

Applicants note that the Examiner indicated in his Advisory Action of January 31, 2006 that "[a]ll previous objections and all previous rejections under 35 U.S.C. § 112 are withdrawn." Thus, the prior objections regarding the specification and drawings, and the prior rejections under 35 U.S.C. § 112, first paragraph and second paragraph, are no longer pending. The only grounds of rejection presented in the Office Action of November 2, 2005 that have been maintained are the rejections under 35 U.S.C. § 103. Thus, these are the only rejections addressed herein.

In addition, Applicants noted an error in claim 1. Specifically, the phrase "randomly generating" appeared in claim 1 in the prior response but it was not formally added (it was not shown as being underlined or discussed in the remarks) and was not meant to be added to the

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claim. Thus, this error was remedied herein by deleting this unintended additional language from claim 1.

REJECTIONS UNDER 35 U.S.C. § 103

Claims 1-4, 6-10, 12, and 21-23 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over WIPO Patent Publication No. 99/01815 to Collberg et al. in view of U.S. Patent No. 6,829,710 to Venkatesan et al. Applicant traverses this ground of rejection.

The cited prior art references do not teach all of the elements of the claims, as amended. As the Examiner admitted, "Collberg does not disclose the random selection from a set of isomorphic codes." Office Action p. 6. Similarly, Collberg does not disclose random selection from a plurality of candidate isomorph codes where *each candidate isomorph code functions in substantially the same manner as each of the other candidate isomorph codes in the plurality and where each candidate isomorph code functions in substantially the same manner as the selected candidate instructions*. During the Interview of February 28, 2006, the Examiner referred to a section of Collberg at the top of page 87 that describes "a set of obfuscating transformations." First, this set of obfuscating transformations is not equivalent to any sort of library containing candidate isomorph codes for selection. Collberg makes very clear throughout his description that the transformations are methods for transforming or obfuscating code. *See* Collberg at pg. 14, lines 8-21; pg. 15, lines 10-13; pg. 16, lines 5-20. While these methods might be performed by a program (e.g., the obfuscator described in Collberg), this set of methods is not a set of candidate codes functioning in substantially the same manner from which a particular code can be selected to replace candidate instructions in the target application. Second, nowhere does Collberg state that each member of this set of methods for obfuscating code functions in substantially the same manner as the other members. In fact, Collberg refers to a number of different obfuscating transformations (e.g., aggregating transformations, ordering transformations, etc.) that all work in different manners to obfuscate code. The obfuscating transformations making up the set are simply methods for obfuscating code that all differ from

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one another. These transformation methods cannot be reasonably compared in functionality to the functionality of any candidate instructions and these methods cannot replace any candidate instructions in the target application.

As stated above, the Examiner admitted that "Collberg does not disclose the random selection from a set of isomorphic codes." Office Action p. 6. The Examiner relied on Venkatesan to provide this element. However, as discussed in the Interview of February 28, 2006, Venkatesan does not disclose random selection from a plurality of candidate isomorph codes where *each candidate isomorph code functions in substantially the same manner as each of the other candidate isomorph codes in the plurality and where each candidate isomorph code functions in substantially the same manner as the selected candidate instructions*. The routines selected from the library described in Venkatesan are not substituted for any candidate instructions, but instead are only inserted within the target code. Thus, the routines cannot function in substantially in the same manner as the candidate instructions they replace, since there is no replacement.

In addition, the routines selected from the library described in Venkatesan do not have substantially the same function as each other. Instead, Venkatesan emphasizes that the library contains routines that typically perform opposite functions. For example, Venkatesan refers to an implementation in which a first and second routine selected from the library are inserted into the target code. *See* Venkatesan, col. 7, lines 42-47. During execution, the first routine is called to alter data or variables in some segment of the target code and later, after some execution, the second routine is called to reverse this change. *See Id.* Without the reversal performed by the second routine, the watermarked program would fail to operate normally. *See Id.* These different functions of the routines are essential to the purpose of Venkatesan's description of inserting a watermarking program into target code in a tamper-resistant manner. If tampering occurs such that one of these routines is removed, the application no longer functions correctly

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since both routines are needed to perform their separate functions. *See* Venkatesan, col. 8, lines 64-67 to col. 9, lines 1-2.

In addition, neither Collberg nor Venkatesan discloses any comparing step where candidate instructions selected for substitution are compared with a plurality of candidate isomorphic codes functioning in the same manner. The members of the "set of obfuscating transformations" in Collberg are not compared against any selected candidate instructions. Similarly, Venkatesan does not describe any step where candidate instructions are selected for substitution and the routines included in the library are compared against the candidate instructions.

Furthermore, as discussed in the Interview with the Examiner, one of ordinary skill in the art would not have had a reasonable expectation of success in combining Collberg and Venkatesan to produce the claimed invention. The library of Venkatesan includes a collection of routines that function differently from one another and function differently from code in the target application. One of ordinary skill in the art would not have expected to successfully use this library containing routines that function in different manners to provide the ability to randomly select a piece of code that could be substituted for target application code in Collberg, and that would function the same as that target code. Venkatesan specifically emphasized the importance of the library routines functioning in different manners in order to provide tamper-resistance for his watermark. One of ordinary skill the art would not have known how to use Venkatesan's library with Collberg in order to provide the random selection element that the Examiner agreed is missing from Collberg.

Further, Venkatesan's approach is not suitable for random selection of code that will be isomorphic to the code at the insertion site in a manner that could be used with Collberg's methods. Rather, Venkatesan's approach depends on the ability to randomly insert a given routine in the library at one of many target sites. The code at each of those target sites likely has substantially different functions. Since Venkatesan's method depends upon his library routines

each being able to be inserted at one of many locations, there is no way that Venkatesan's method could be used to randomly select a routine to be substituted at one defined location (to replace specific target code that functions in substantially the same manner). This would defeat the very randomness upon which the Examiner relies on Venkatesan to provide (randomness of location for insertion, since the library routines themselves are not randomly selected). *See* Advisory Action. Even if Venkatesan were only relied upon to provide the "randomness" aspect of the invention, Venkatesan's randomness simply would not work with Collberg's methods to produce the claimed invention.

With regard to amended claims 12 and 21, the Examiner did not provide an explanation as to where the elements of these claims are found in the cited references. Applicants submit that the claims as originally written and as amended overcome the combination of Collberg and Venkatesan. Neither Venkatesan, nor Collberg, discloses a virtual CPU pre-processor that uses a matchable data structure for correlating said random context instruction codes to said original CPU instructions where that matchable data structure is randomly created when the application initializes.

Accordingly, for at least the reasons stated above, claims 1, 10 and 21 cannot be rendered obvious by the cited references. Claims 2-4 and 6-9 depend from claim 1 and incorporate all of the elements of claim 1, while claims 22-23 depend from claim 21 and incorporate all of the elements of claim 21. Thus, dependent claims 2-4, 6-9, and 22-23 cannot be rendered obvious by the cited combination at least for the reasons described above.

Claims 1 and 5 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over U.S. Patent No. 5,696,822 to Nachenberg in view of U.S. Patent No. 6,829,710 to Venkatesan et al. Applicant traverses this ground of rejection.

The cited prior art references do not teach all of the elements of the claims, as amended. The Examiner admitted that "Nachenberg does not disclose the random selection from a set of isomorphic codes." Office Action p. 7. At least for the reasons Applicants described above,

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Venkatesan cannot be used to provide this element. Thus, neither Nachenberg nor Venkatesan disclose random selection from a plurality of candidate isomorph codes where *each candidate isomorph code functions in substantially the same manner as each of the other candidate isomorph codes in the plurality and where each candidate isomorph code functions in substantially the same manner as the selected candidate instructions.* As described above, Venkatesan's library does not involve any selection from a set of codes that function in substantially the same manner. Venkatesan's library also does not involve selection of a code that functions in substantially the same manner as the code that is being replaced in the target application (since there is no replacement, only insertion, and since the routines selected from the library do not likely function in the same manner as the codes that they are inserted next to). In addition, the Examiner pointed to a brief description in Nachenberg (col. 1, lines 11-17) of polymorphic viruses and generally how they work. Office Action at p. 7. The section cited does not include each of the steps described in claim 1. There are various mechanisms by which the polymorphic virus might work, and thus one cannot assume that the each steps described in claim 1 were used.

Similarly, one of ordinary skill in the art would not have reasonably expected success in combining the vaguely described methods of Nachenberg with Venkatesan to create the invention described in claim 1 for the same reasons as described above in relation to the Collberg and Venkatesan combination. Further, it is unlikely that the Venkatesan library could even be used with the Nachenberg methods, as described above in relation to Collberg/Venkatesan.

Accordingly, the Applicants respectfully submit claim 1 cannot be rendered obvious by the cited references. Since claim 5 depends from and incorporates all of the elements of claim 1, claim 5 also cannot be rendered obvious by the cited references.

Claims 48, 49, and 51-53 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over U.S. Patent No. 6,006,328 to Drake further in view of U.S. Patent No. 6,829,710 to Venkatesan et al.

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The cited prior art references do not teach all of the elements of the claims, as amended. Claims 48 and 53 include all of the elements of amended claim 1, so the same arguments apply as described above. The Examiner admitted that "Drake does not disclose the use of random algorithms." Office Action p. 8. At least for the reasons Applicants described above, Venkatesan cannot be used to provide this element. Thus, neither Drake nor Venkatesan disclose random selection from a plurality of candidate isomorph codes where *each candidate isomorph code functions in substantially the same manner as each of the other candidate isomorph codes in the plurality and where each candidate isomorph code functions in substantially the same manner as the selected candidate instructions.* The section of Drake cited by the Examiner describes usage of "obfuscating inserts" and states that "[o]bfuscation is achieved by following unconditional jump instructions...with one or more dummy op-code bytes which will cause subsequent op-codes to be erroneously disassembled." Drake at col. 5, lines 42-54. In addition, the sections of Drake and Venkatesan cited do not disclose any comparing step where candidate instructions selected for substitution are compared with a plurality of candidate isomorphic codes functioning in the same manner.

Similarly, one of ordinary skill in the art would not have reasonably expected success in combining the methods of Drake with Venkatesan to create the invention described in claims 48 and 53 for the same reasons as described above in relation to the Collberg and Venkatesan combination. Further, it is unlikely that the Venkatesan library could even be used with the Drake methods, as described above in relation to Collberg/Venkatesan.

Accordingly, for at least the reasons stated above, the claims 48 and 53 cannot be rendered obvious by the cited references. Claims 49, 51, and 52 depend from claim 48 and incorporate all of the elements of claim 48. Thus, claims 49, 51, and 52 cannot be rendered obvious by the cited combination at least for the reasons described above.

Claim 50 is rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over U.S. Patent No. 6,006,328 to Drake in view of U.S. Patent No. 6,829,710 to Venkatesan et al. as

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applied to claim 48 further in view of U.S. Patent No. 5,966,450 to Hosford et al. Applicant traverses this ground of rejection. Claim 50 depends from claim 48 and incorporates all of the elements of claim 48. Thus, claim 50 cannot be rendered obvious by the cited combination at least for the reasons described above regarding why claim 48 is not rendered obvious by Drake in view of Venkatesan. Hosford does not remedy the deficiencies of Drake and Venkatesan.
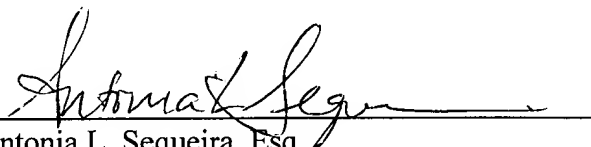
In conclusion, the cited references do not disclose all the limitations of the claims, and there is no reasonable expectation of success in combining the references. Accordingly, a *prima facie* case of obviousness has not been presented by the Office. Therefore, withdrawal of this ground of rejection of claims 1-10, 12, 21-23, and 48-53 is respectfully requested.

CONCLUSION

Withdrawal of the pending rejections and reconsideration of the claims are respectfully requested, and a notice of allowance is earnestly solicited. If the Examiner has any questions concerning this Response, the Examiner is invited to telephone Applicant's representative at (650) 335-7185.

Respectfully submitted,
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